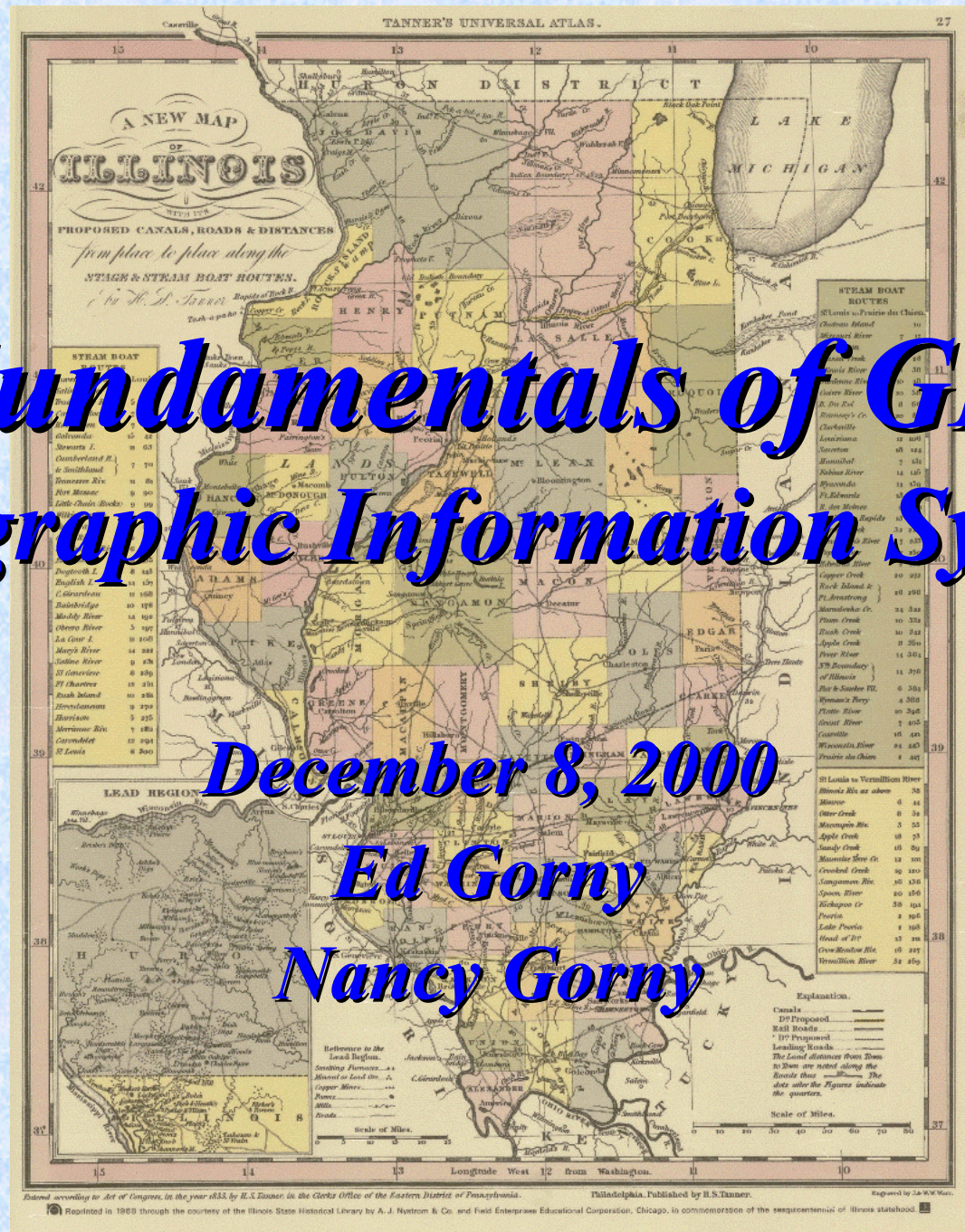# Fundamentals of GIS
Geographic Information System

December 8, 2000

Ed Gorny

Nancy Gorny

History of Mapping

Historically, maps have been used for:

- *navigating through unfamiliar lands and waters*

- *communicating information about relative locations of objects such as cities, countries and oceans*

Early Use of Theme Maps Included:

- *Maps of the Battle of Yorktown drawn by the French Cartographer Louis-Alexandre Berthier contained hinged overlays to show troop movements. (American Revolution)*

- *The mid-19th Century "Atlas to Accompany the Second Report of the Irish Railway Com-missioners" showed population, traffic flow, geology and topography superimposed on the same base map.*

Early Use of Theme Maps Included:

Dr. John Snow used a map showing the location of death by cholera in central London in 1854 to track the source of the outbreak to a contaminated well.
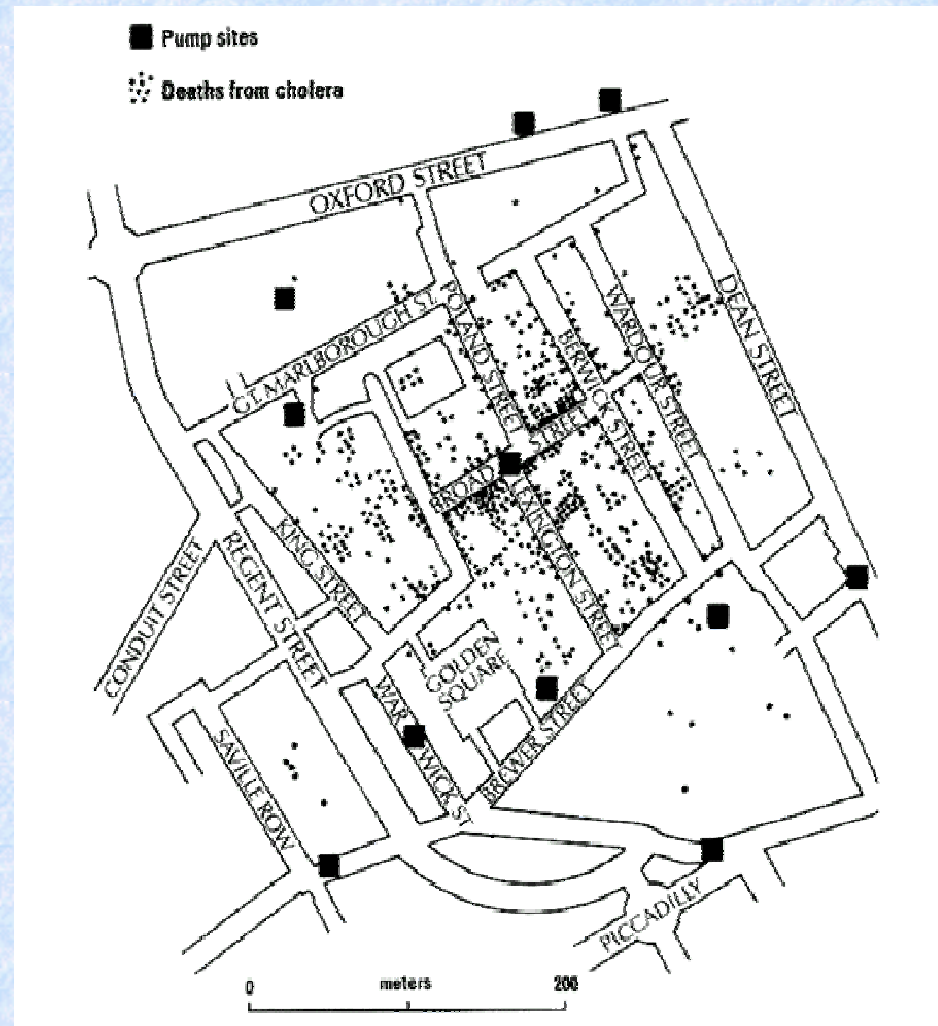
GIS Sprang out of Cartography

- *Cartography became important in modern society for war-time mapping.*

- *New data sets became available from aerial photography missions.*

- *Earliest GIS developed in the 1960s.*

- *A need develops to analyze data that was being collected for statistical studies.*

What is GIS?

❶ *GIS is a "Geographic Information System".*

❷ *GIS is a system designed for storing, updating, analyzing, displaying, and manipulating spatial data - information about places on the planet.*

❸ *GIS uses the power of the computer to answer questions by arranging and displaying all kinds of data about places in a variety of ways such as maps, tables and charts.*

That Almost Sounds Scary!

- *Think of GIS centering around maps.*

- *Maps can be powerful tools to make decisions, find objects, and discover trends, events and other spatial relations beyond individual locations of information.*

- *GIS is a new trend in geographic decision making that consists of maps, databases, query and analytical relations.*

What Makes Up GIS?

- *GIS is a mixture of information about the real world (layers or themes):*
  - *population and political boundaries*
  - *interstates, highways and local roads*
  - *rivers, elevation and other physical features*
  - *any other data you can think of and collect*
- *Another main components is YOU, the Intelligent Thinker!*

How Does GIS Work?

- **Data and Information is stored as a collection of thematic layers**
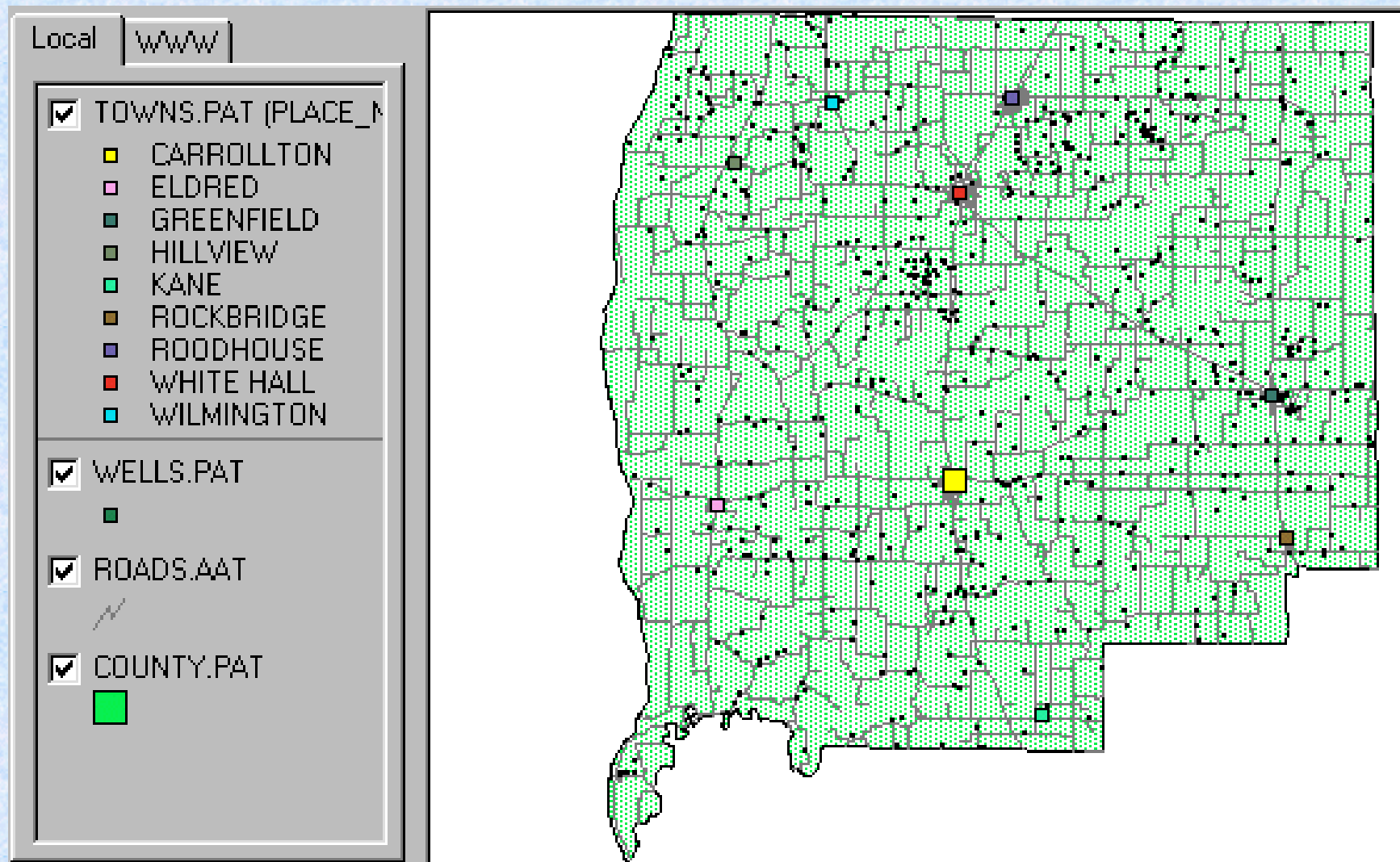- **Think of GIS as a sandwich that YOU put together**
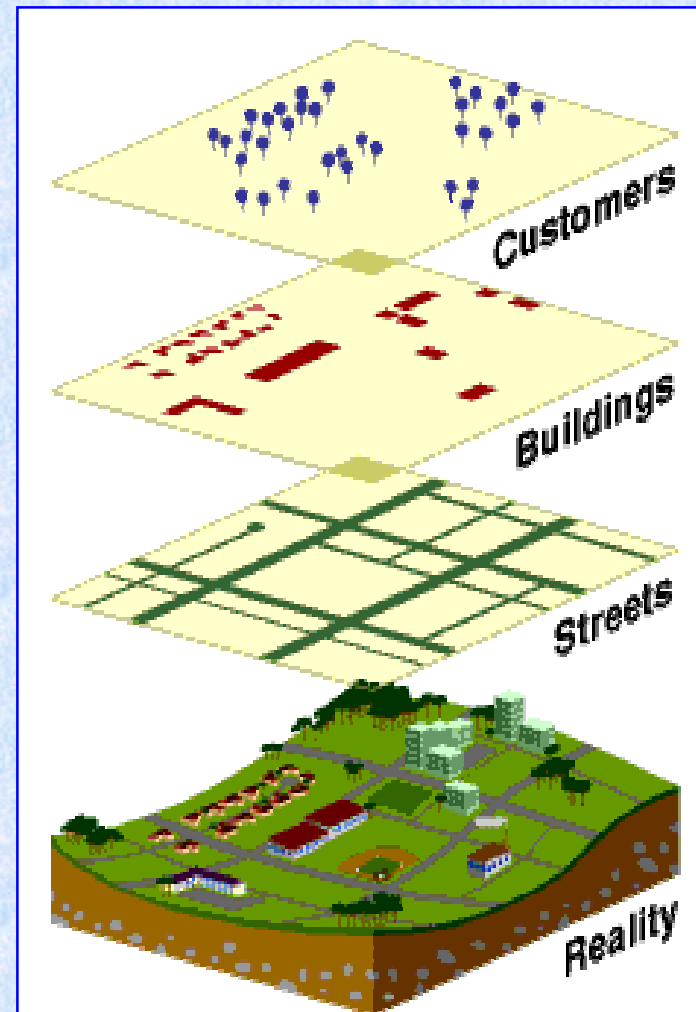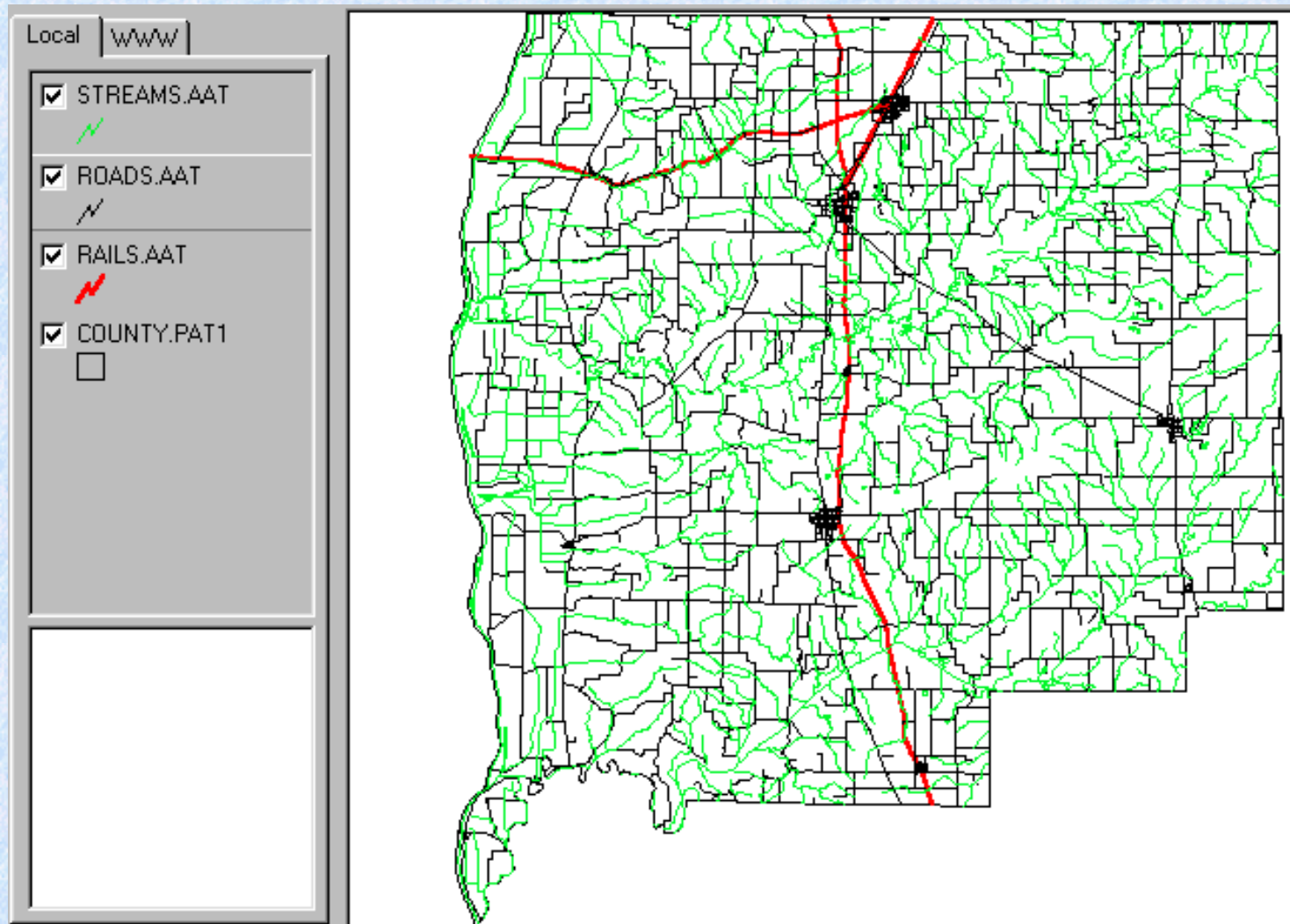
What are the Main Layers of GIS?

- *Points*
  - *towns, cities, state capitals*
  - *trees, fire hydrants, stop lights*
- *Lines*
  - *highways, rivers, fault lines*
  - *boundaries, railroads, utilities*
- *Areas*
  - *states, forests, mountain ranges, lakes*
  - *land use, school districts, soil types*

Examples of Points

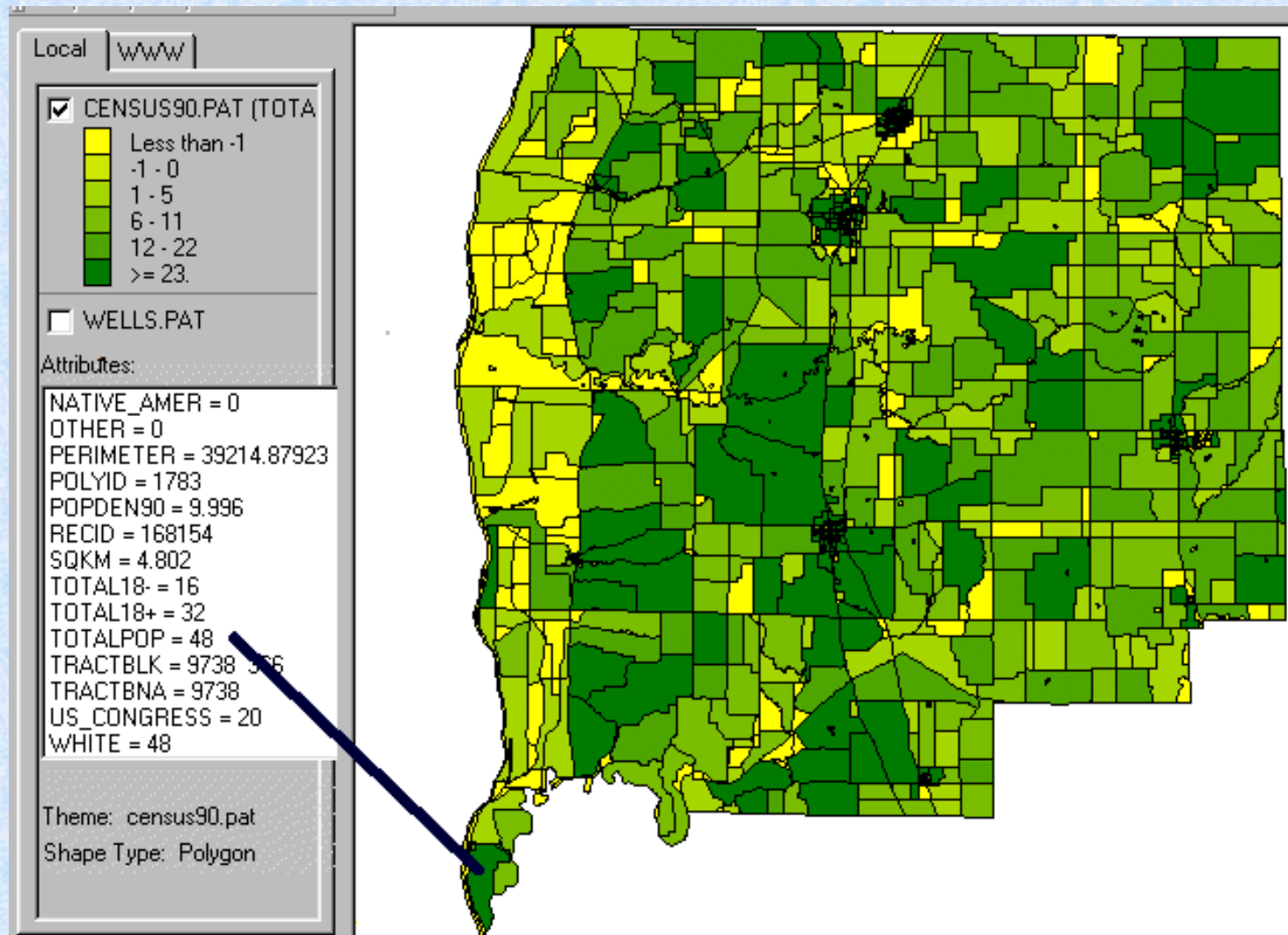# *Examples of Lines*

Examples of Areas

Local | WWW

☑ CENSUS90.PAT (TOTA
- ☐ Less than -1
- ☐ -1 - 0
- ☐ 1 - 5
- ☐ 6 - 11
- ☐ 12 - 22
- ☐ >= 23.

☐ WELLS.PAT

Attributes:

NATIVE_AMER = 0
OTHER = 0
PERIMETER = 39214.87923
POLYID = 1783
POPDEN90 = 9.996
RECID = 168154
SQKM = 4.802
TOTAL18- = 16
TOTAL18+ = 32
TOTALPOP = 48
TRACTBLK = 9738 956
TRACTBNA = 9738
US_CONGRESS = 20
WHITE = 48

Theme: census90.pat

Shape Type: Polygon

GIS Integrates All the Parts…
to See the Whole!

- Homes
- School Districts
- Streets
- Zip Codes
- Cities
- Counties

Reality

What are the Components of GIS?
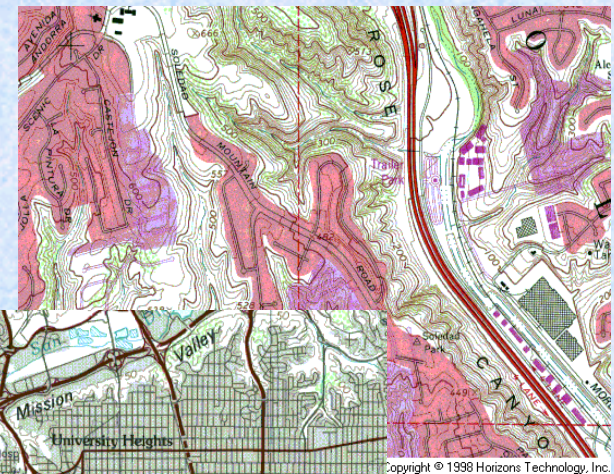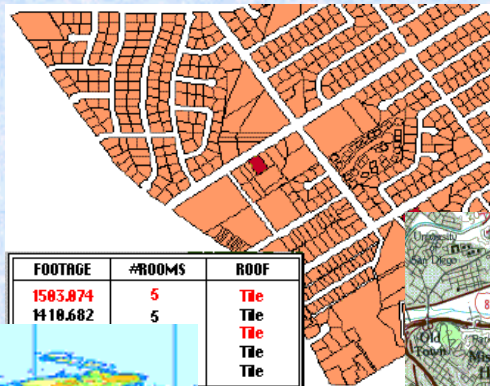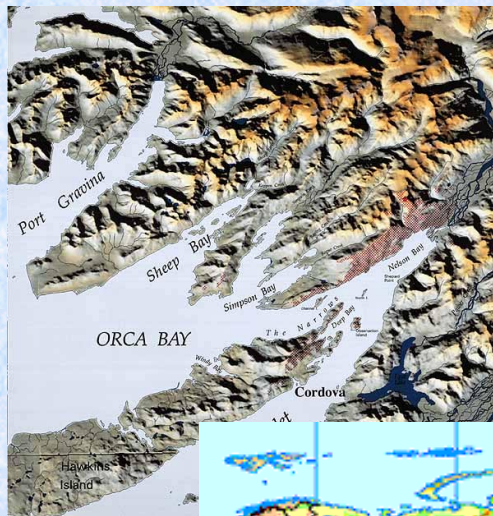
- *Hardware*

- *Software*

- *Data Collection*

- *Methods of Analysis*
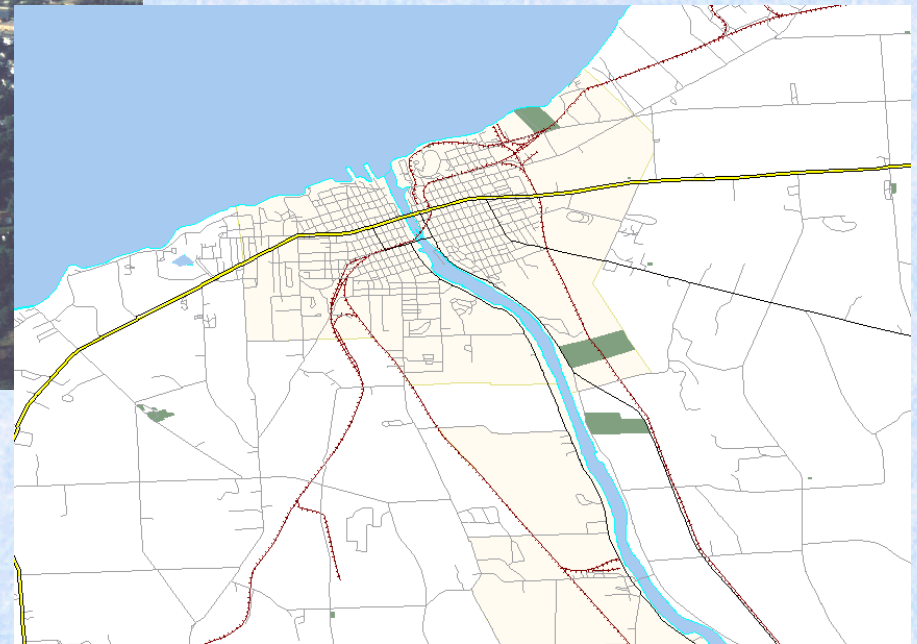
- *People - Thinkers*

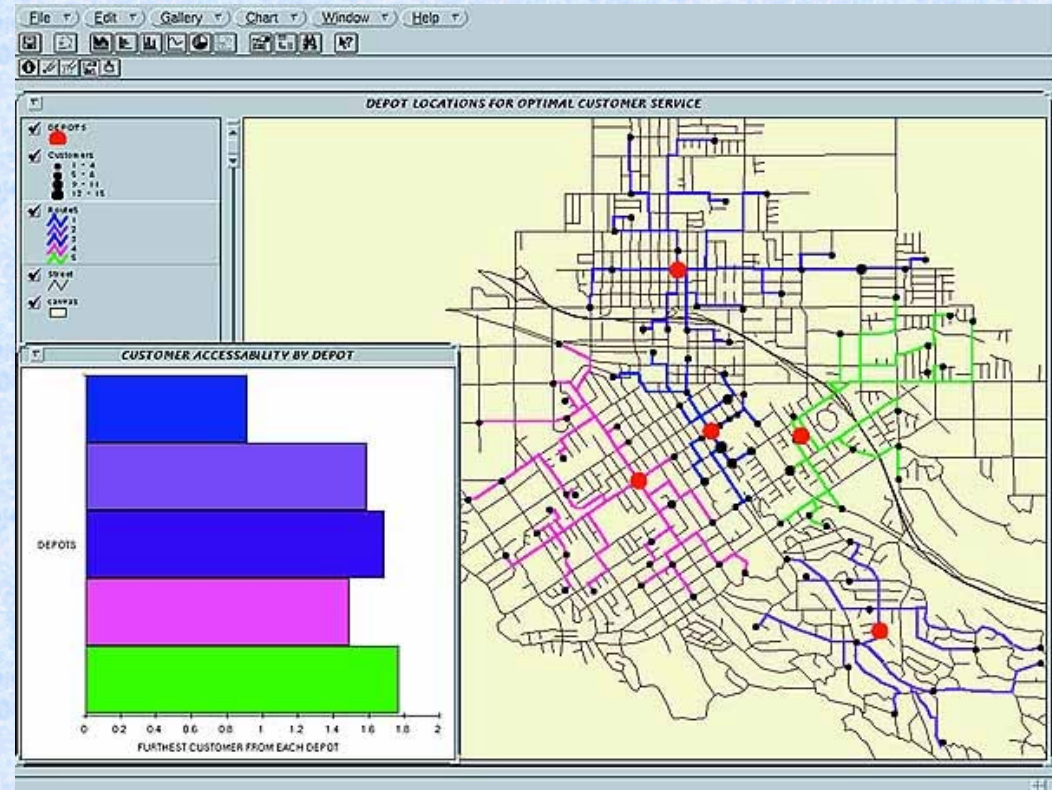# *Maps of GIS*
Come in many flavors!
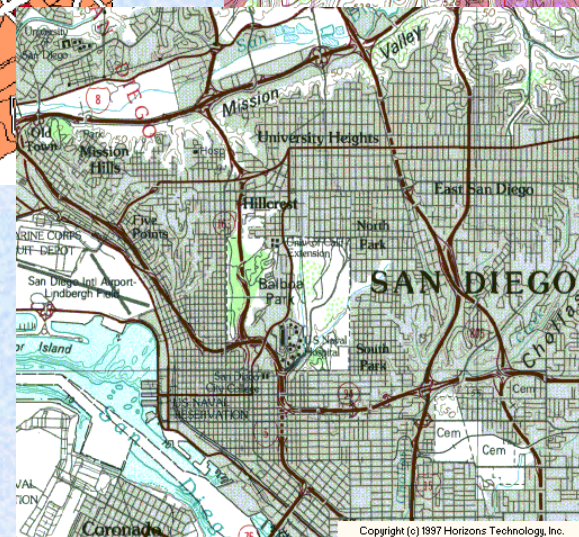
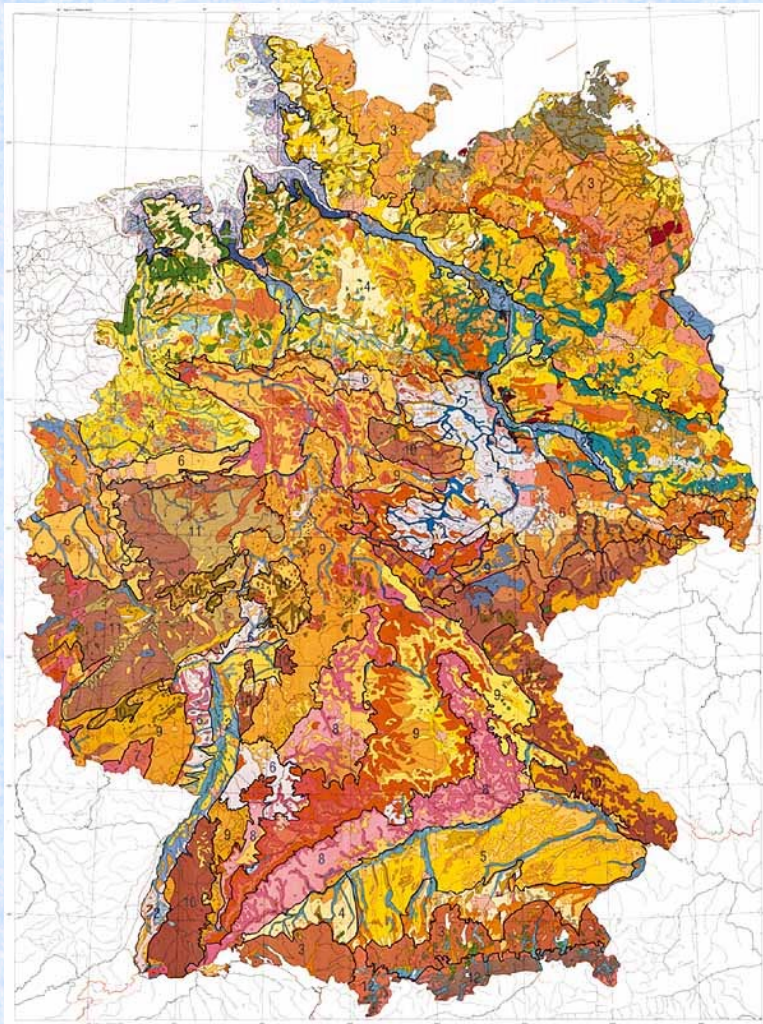# *Maps are graphic representations of the real world*

Query: City Maps in your neighborhood

What are the best routes for your school buses in order to get everyone home the fastest?
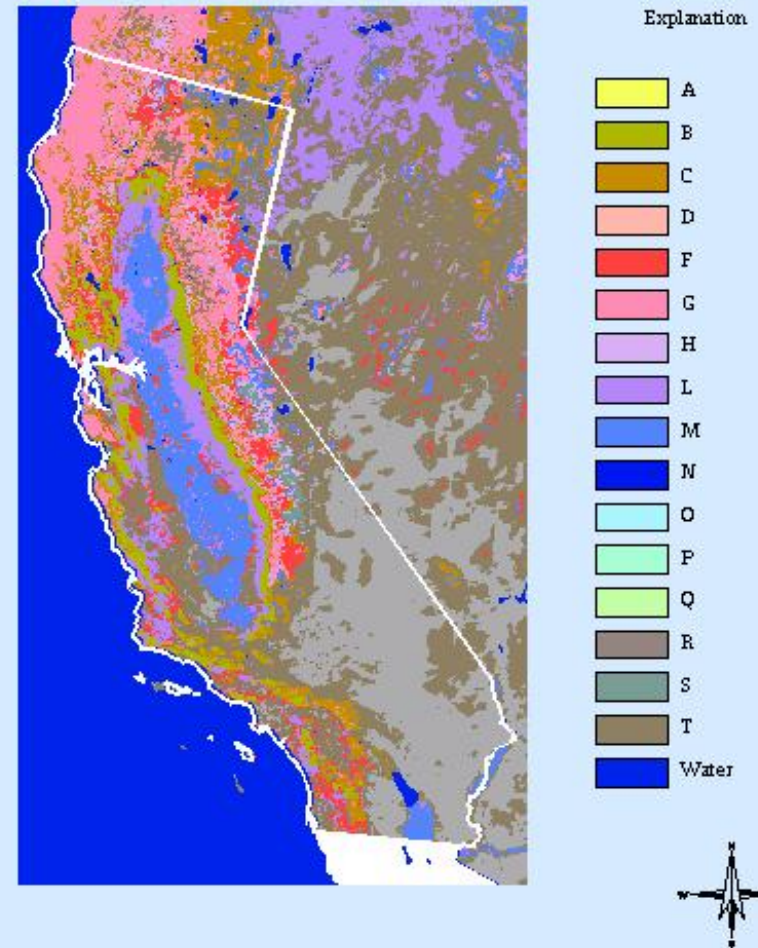
Environmental maps...

National Fire Danger Fuel Models

What Can a GIS Do for You?

- *Perform Geographic Queries and Analyses*

- *Map, Model, and Analysis Data*

- *Make Better Decisions and Create Better Solutions*

But Why?

- *GIS Is about finding patterns.*
- *Lots of data is coming from different sources. You will want to consider all of it to make better decisions.*
- *Answer the questions of location such as where, why, and how.*
- *Solve problems and make decisions.*
- *See patterns and trends that spreadsheets and charts alone won't portray.*

What Does GIS Really Mean?
Something to think about!

❶ *Geographic Information Systems*
  – *Using the Tools of GIS to solve a problem?*

❷ *Geographic Information Science*
  – *Studying the theory and concepts behind GIS?*
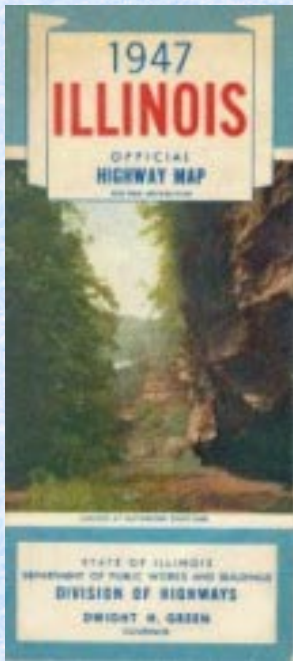
❸ *Geographic Information Studies*
  – *Studying the social context of geographic information?*

"The application of GIS is limited only by the imagination of those who use it"
Jack Dangermond

One Major Problem with GIS!

- *As you will discover, GIS is a very powerful tool. However, there is one thing NO GIS system can do.*

- *Any idea???*

Well it can't figure out how to fold up that paper map.

Some of the pictures viewed in this presentation have come from public web sites. Thanks to all for the time and effort put forth in their creation….